



The National Center for Post-Traumatic Stress Disorder

PTSD RESEARCH QUARTERLY

VOLUME 13, NUMBER 4

ISSN 1050-1835

FALL 2002

Published by:

The National Center for PTSD
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PSYCHOLOGICAL AND BEHAVIORAL IMPACTS OF BIOTERRORISM

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The primary goal of terrorism is to disrupt society by provoking intense fear and shattering all sense of personal and community safety. The target is an entire nation, not only those who are killed, injured, or even directly affected. Terrorism is a special type of disaster, one caused by human malevolence, that produces higher rates of psychiatric casualties than do natural disasters or technological accidents.

Terrorist attacks using weapons of mass destruction, particularly chemical and biological agents, are relatively new phenomena. The Aum Shinrikyo's 1995 sarin attack on the Tokyo subway system brought this to the world's attention, and concern increased after it was learned that the group had tried to release anthrax and to obtain the Ebola virus. The destruction of the World Trade Center towers on September 11, 2001 was followed by a bioterrorist attack. Letters containing anthrax spores were mailed to media outlets and government officials. These attacks were circumscribed, but calculated to inflict maximal psychological casualties, social disruption, and economic downturn.

Weapons of mass destruction are increasingly referred to by the acronym CBRNE (chemical, biological, radiological, nuclear, and high-yield explosives), as it avoids conjecture about their impact. These weapons are especially effective at causing terror, as delineated by Holloway et al. (1997). Conventional weapons produce immediate, tangible health consequences, while biological agents have protracted impacts and ongoing risks that are difficult to assess. Deformity and disfigurement that is caused by an illness such as smallpox amplifies horror, and the potential for person-to-person transmission heightens fear and anxiety. Most chemical and biological weapons agents are invisible, odorless, and imperceptible to humans. Dormant biological agents such as anthrax spores can persist undetected for years in the environment. Availability of medical treatment for many of these illnesses is limited, there is uncertainty about the efficacy of

therapies, and there are concerns that prophylaxis such as vaccines may be ineffective or dangerous.

There is little in the scientific literature on the psychological consequences of bioterrorism and how to protect people from these effects. Observations on attacks using unconventional weapons and literature from events such as natural outbreaks and accidents provide relevant background. North et al. (1999) have extensively studied and written about the mental-health response to the Oklahoma City bombing in 1995. Norris et al. (2002) reviewed the epidemiological disaster literature, analyzing over 200 articles published since 1981 on the psychological effects of natural and intentional disasters on over 60,000 people.

As in other kinds of disasters, a CBRNE attack will result in psychiatric morbidity for some. At highest risk are those directly exposed, who may become ill with PTSD, depression, and alcohol use, and those who were vulnerable before the event, whether already suffering from mental illness or depending on resources and support that become disrupted. Millions of ordinary people in the nation will experience an altered sense of safety and hypervigilance. Ursano (2002) points out that most individuals' acute stress symptoms following CBRNE terrorism are transitory and that the acute form of PTSD occurs commonly. In a clinical-interview study of direct survivors of the Oklahoma City bombing in the US, North et al. (1999) found 34% had PTSD, and 22% had major depression. Nearly 40% of those with PTSD and depression had no previous psychiatric illness, and these individuals were more likely to have experienced a greater amount of exposure. Other trauma-related disorders will develop and will be seen first in primary care settings. These include unexplained somatic symptoms, depression, generalized anxiety disorder, panic disorder, and increased alcohol, nicotine, or other substance use as well as family conflict and family violence.

There have been several studies looking at the early impacts of September 11, 2001. Schuster et al. (2001) conducted one of the earliest studies, interviewing 560 adults nationwide three to five days after the attack, and found that 44% reported one or more symptoms of stress. In a public mental health needs assessment, Susser et al. (2002) extrapolated telephone survey data and estimated that 422,000 people in New York State alone would suffer from PTSD. Galea et al. (2002) conducted telephone inter-

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views of 1008 Manhattan residents one to two months after the attacks and reported that 7.5% of them would meet criteria for a diagnosis of PTSD related to the attacks. This figure rose to 20% in people living close to the World Trade Center. Schlenger et al. (2002), using a web-based survey instrument related to the clinical diagnosis of PTSD, calculated the prevalence of PTSD in New York City to be 11.2%. Hundreds of thousands of people were affected, most not directly exposed.

North and Pfefferbaum (2002) note that conducting research on mental health in the acute setting of disasters is difficult, and even more complicated in terrorist events. Post-disaster research that relies on survey measures of symptoms and distress collects important information but does not provide data on clinical psychiatric diagnoses. Differentiating illness from distress is critical to assessing an affected population's mental-health needs and planning intervention strategies.

Government agencies and public-health leaders had not considered mental health to be a major component of an overall response plan for a terrorist event before September 11, 2001. In an informal survey by Hall et al. (in press), in the summer of 2001, none of 18 states' departments of mental health had developed response plans that addressed psychological and behavioral consequence management for a bioterrorism event. Even conservative estimates highlight a staggering need for public outreach, education, and acute mental-health care following a CBRNE event.

Psychological distress and psychiatric conditions are only two of many indirect effects of a terrorist attack. Holloway et al. (1997) argue that government and private agencies need to incorporate social and behavioral impacts into bioterrorism planning. Response to a biological or chemical event requires not only emergency triage of medical and psychological casualties but, most importantly, effective education and risk communication to contain panic.

The word "panic" is often used to describe psychological responses to CBRNE acts of terrorism. Panic refers primarily to a group phenomenon in which intense, contagious fear causes individuals to think only of themselves. While panic does occur following disasters, it is extremely rare. Among risk factors for panic are the belief that there is a small chance of escape; seeing oneself as being at high risk of becoming ill; available, but limited, resources in which "first come, first serve" prevails; a perceived lack of effective management of the catastrophe; and loss of credibility by authorities.

The assumption that people will panic or become irrational following an attack has negative consequences. Authorities may provide inaccurate information or unfounded reassurances motivated by a wish to calm the public. The panic myth may also lead to the neglect of the public's role in planning and response and missed opportunities to capitalize on the resourcefulness of nonprofessionals and civic organizations. Historically, people and communities actually respond cooperatively and adaptively in most natural and manmade disasters, according to Glass and

Schoch-Spana (2002). Calm, reasonable behavior was the rule during the uncertainty following reports of the Three Mile Island nuclear accident. People evacuated the World Trade Center after the 1993 bombing and after the attack on 9/11 in an orderly fashion. Many lives were saved. In spite of some mismanagement of information following the anthrax attacks in October 2001, there is no evidence that panic ensued, even in communities closest to contaminated mail. History and lessons learned provide planning guidelines for bioterrorism preparation involving the public and civic organizations.

CBRNE events highlight the importance of the psychology of individual risk perception and how decisions to seek medical evaluation are made. Our health care system has little direct experience in the management of CBRNE terrorism. Karsenty et al. (1991) review the Israeli casualties resulting from the Iraqi Scud missile attacks between January and February 1991. Over 1,000 people presented for emergency medical care during this period, but only 22% were directly injured by the missile explosions. The overwhelming majority (78%) were behavioral and psychiatric casualties. Most suffered from acute anxiety, others from the side effects of auto-injected atropine, injuries sustained running to safety, suffocation from incorrect use of gas masks, or acute myocardial infarction. Ohbu et al. (1997) looked at the acute demand for medical care following the 1995 Aum Shinrikyo sarin gas attacks in Tokyo. The attack killed 11 people, created toxic symptoms in slightly over 1,000 people who were hospitalized, and caused more than 4,000 people who had no signs of exposure to seek emergency care, believing they had been poisoned.

These experiences highlight the possibility that medical facilities could be overwhelmed by the needs of people who have not have actually been exposed. Triage of those who may be distressed from those who are injured is a critical first step in emergency care.

DiGiovanni (1999) asserts that a CBRNE event is likely to set off outbreaks of mass sociogenic illness. The occurrence of mass sociogenic illness in the wake of a CBRNE attack is a major concern for planners, who worry about the strain it will place on an already overburdened medical system. Boss (1997) reviewed the literature on epidemic hysteria. Mass sociogenic illness, also referred to as mass psychogenic illness and epidemic hysteria, is a social phenomenon in which two or more people share beliefs about a constellation of symptoms for which no identifiable etiology can be found. This illness is often triggered by an environmental incident, such as nuclear and chemical releases, smog, or water-supply contamination for which there is a robust emergency response. Individuals experiencing acute, unexplained symptoms attribute their illness to the environmental exposure. Wessely et al. (2001) report on a series of outbreaks of mass sociogenic illness in the wake of 9/11. On September 29, 2001, paint fumes in a Washington-state middle school triggered a bioterrorism scare in which 16 students and 1 teacher were medically evaluated. On October 3, 2001, rumors of bioterrorism prompted more than one thousand students in Manila, Philippines to deluge

clinics with complaints of flu-like symptoms. On October 9, 2001, a DC Metro passenger sprayed an unknown substance (later identified as cleaning fluid) on a train, and 35 people developed nausea, headache, and sore throat.

Hyams et al. (2002) categorize the indirect health effects of a CBRNE attack on a continuum from acute to chronic impacts, thereby facilitating planning for terrorism by government agencies and social institutions. A bioterrorism attack or the threat of an attack can have substantial long-term psychological impacts on individuals and communities. The authors incorporated observations and experience gained since September 11 and the anthrax mailings in October 2001. Four major long-term health concerns are explored: (1) chronic injuries and disease caused by the toxic event; (2) questions about adverse reproductive outcomes; (3) psychological effects; and (4) increased levels of unexplained somatic symptoms. Issues such as eligibility for health care, the effects of low-level chemical and radiation exposure, stress-related illnesses, unlicensed therapeutics (off-label uses), and financial compensation all make planning and response to a CBRNE terrorist event more complex and challenging.

Engel et al. (1999) review the history of controversial, medically unexplained syndromes (shell shock following World War I; Agent Orange poisoning following Vietnam; and Gulf War syndrome). A terrorist attack using any chemical, biological, radiological, or explosive weapon is likely to generate similar disabling conditions unless specific pre- and post-event health care strategies are developed. They advocate a stepwise approach linking population-based health care, a public-health approach, with the delivery of individual clinical services. Population-based pre-attack interventions include workplace, family-education, and public-service announcements. Post-attack interventions such as workplace support networks and "lay" debriefings are followed by primary-care screening evaluations and in-depth clinical management only if dictated by symptom severity. This is a proactive plan to mitigate risk of chronic symptoms and disability arising from a CBRNE event. It emphasizes an open, problem-solving partnership between patient and physician.

Bioterrorism exercises frequently adopt large-scale quarantine scenarios as a blanket disease-management strategy. Reviewing the history of this recognized public-health tool, Barbera et al. (2001) challenge the appropriateness of quarantine because of the risk of unintended consequences and lack of efficacy. The thoughtful development of policies and procedures to guide officials in the event of a communicable-disease outbreak rests on answering three questions: Does the medical analysis warrant large-scale quarantine?; Are the logistics (who, how, and for how long) of actually establishing such a quarantine feasible?; and Do potential benefits outweigh adverse impacts and increased risk to health, orderly public conduct, and economic stability? Many more credible disease containment steps are available, such as rapid vaccination and treatment programs, voluntary home curfew, and restrictions on assembly of groups.

In their discussion of quarantine, Barbera et al. (2001) conclude with recommendations that communities and planners adopt risk communication strategies as critical elements of any bioterrorism preparedness plan. Risk communication is a scientifically based method for communicating effectively under high-threat conditions. Government and public-health officials must be prepared to inform and instruct targeted populations, health care providers, first responders, and the news media. Covello et al. (2001), drawing on the experience and challenges posed by the West Nile virus epidemic, highlight that education and communication will minimize panic and fear. Effective risk communication can reduce or eliminate negative psychological responses in general, insure appropriate individual and public self-protective behaviors, build trust, and dispel rumors and misinformation. Without credible, well-delivered information, vulnerable groups may not follow a recommended treatment regimen, others may not use prophylaxis appropriately, the public may not trust experts' assessments of risk, and the likelihood of social disruption and panic increases. The greater the level of fear and uncertainty, the more likely that critical information will be misconstrued or overlooked. The most useful bioterrorism preparedness plans will be based on knowledge of the psychological processes influencing assessment of danger, threat, and response to uncertainty.

In summary, bioterrorism raises new and different behavioral and mental-health issues. The mental-health system, as part of the public-health system, must address needs for surge capacity and health surveillance in order to best provide care for communities exposed to CBRNE terrorism and, in particular, bioterrorism.

SELECTED ABSTRACTS

BARBERA, J., MACINTYRE, A., GOSTIN, L., INGLESBY, T., O'TOOLE, T., DEATLEY, C., TONAT, K., & LAYTON, M. (2001). **Large-scale quarantine following biological terrorism in the United States: Scientific examination, logistic and legal limits, and possible consequences.** *Journal of the American Medical Association*, 286, 2711-2717. Concern for potential bioterrorist attacks causing mass casualties has increased recently. Particular attention has been paid to scenarios in which a biological agent capable of person-to-person transmission, such as smallpox, is intentionally released among civilians. Multiple public health interventions are possible to effect disease containment in this context. One disease control measure that has been regularly proposed in various settings is the imposition of large-scale or geographic quarantine on the potentially exposed population. Although large-scale quarantine has not been implemented in recent US history, it has been used on a small scale in biological hoaxes, and it has been invoked in federally sponsored bioterrorism exercises. This article reviews the scientific principles that are relevant to the likely effectiveness of quarantine, the logistic barriers to its implementation, legal issues that a large-scale quarantine raises, and possible adverse consequences that might result from quarantine action. Imposition of large-scale quarantine—compulsory sequestration of groups of possibly exposed persons or human confinement within certain geographic areas to prevent spread of contagious disease—should not be considered a primary public

health strategy in most imaginable circumstances. In the majority of contexts, other less extreme public health actions are likely to be more effective and create fewer unintended adverse consequences than quarantine. Actions and areas for future research, policy development, and response planning efforts are provided.

BOSS, L.P. (1997). **Epidemic hysteria: A review of the published literature.** *Epidemiologic Reviews*, 19, 233-243. Epidemic hysteria, known by multiple synonymous terms, including mass hysteria, mass psychogenic illness, and mass sociogenic illness, has been defined as a constellation of symptoms suggestive of organic illness, but without an identifiable cause, that occurs between two or more people who share beliefs related to those symptoms. This review was conducted because 1) numerous environmentally related epidemics may have some component of epidemic hysteria; 2) attention is rarely, if ever, given to the concept of epidemic hysteria in schools of public health or in training programs in epidemiology; and 3) few of these outbreaks are reported in epidemiology journals. My current effort reviews outbreaks of epidemic hysteria reported in the English-language literature as having occurred from 1973 through 1993 (period 2) and compares and contrasts these reports with those from the period 1872 to 1972 (period 1). Considerable differences were found in the type of epidemics reported during the two time periods. [Adapted from Text]

COVELLO, V.T., PETERS, R.G., WOJTECKI, J.G., & HYDE, R.C. (2001). **Risk communication, the West Nile virus epidemic, and bioterrorism: Responding to the communication challenges posed by the intentional or unintentional release of a pathogen in an urban setting.** *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 78, 382-391. The intentional or unintentional introduction of a pathogen in an urban setting presents severe communication challenges. Risk communication—a science-based approach for communicating effectively in high-concern situations—provides a set of principles and tools for meeting those challenges. A brief overview of the risk communication theoretical perspective and basic risk communication models is presented here, and the risk communication perspective is applied to the West Nile virus epidemic in New York City in 1999 and 2000 and to a possible bioterrorist event. The purpose is to provide practical information on how perceptions of the risks associated with a disease outbreak might be perceived and how communications would be best managed.

DIGIOVANNI, C. (1999). **Domestic terrorism with chemical or biological agents: Psychiatric aspects.** *American Journal of Psychiatry*, 156, 1500-1505. *Objective:* This article highlights the mental health consequences of a domestic terrorist incident involving chemical or biological weapons. *Method:* The author reviews the literature on the neuropsychiatric effects of selected chemical and biological weapon agents, on the psychological sequelae of mass disasters, and on approaches to crisis intervention. *Results:* Disturbances of behavior, affect, and cognition can result directly from the pharmacological actions of some chemical and biological weapon agents. In addition, an incident involving these agents can have considerable psychological effects on individuals and the community. In either case, some disorders are acute and others are prolonged or delayed in onset. Effective therapeutic intervention involves a broad range of clinical, social, and administrative actions. *Conclusions:* Psychiatrists have an important role in the management of a chemical or biological terrorist incident and, along with their other medical colleagues, should train and prepare for it.

ENGEL, C.C. & KATON, W.J. (1999). **Population and need-based prevention of unexplained physical symptoms in the community.** In L.M. Joellenbeck, P.K. Russell, & S.B. Guze (Eds.), *Strategies to protect the health of deployed U.S. forces: Medical surveillance, record keeping, and risk reduction* (pp. 173-212). Washington, DC: National Academy Press. This review of extensive published research suggests that medically unexplained physical symptoms (MUPS) are pervasive and contribute substantially to physical, social, occupational, and organizational impairment, psychosocial distress, unnecessary health care utilization and expenditures, and adverse health care outcomes. These studies suggest that the natural history of MUPS is influenced by a number of predisposing, precipitating, and perpetuating factors and that certain prognostic factors may help clinicians and policy makers estimate the outcomes and population needs. We use the epidemiology of MUPS and the basic principles of population-based health care to construct an efficient MUPS prevention strategy that emphasizes a continuum of care. We suggest that future improvement efforts target military clinicians, military health care delivery, the military work environment, and existing methods of compensating and returning ill personnel to work. [Adapted from Text]

GALEA, S., AHERN, J., RESNICK, H., KILPATRICK, D., BUCUVALAS, M., GOLD, J., & VLAHOV, D. (2002). **Psychological sequelae of the September 11 terrorist attacks in New York City.** *New England Journal of Medicine*, 346, 982-987. *Background:* The scope of the terrorist attacks of September 11, 2001, was unprecedented in the United States. We assessed the prevalence and correlates of acute PTSD and depression among residents of Manhattan five to eight weeks after the attacks. *Methods:* We used random-digit dialing to contact a representative sample of adults living south of 110th Street in Manhattan. Participants were asked about demographic characteristics, exposure to the events of September 11, and psychological symptoms after the attacks. *Results:* Among 1008 adults interviewed, 7.5% reported symptoms consistent with a diagnosis of current PTSD related to the attacks, and 9.7% reported symptoms consistent with current depression (with "current" defined as occurring within the previous 30 days). Among respondents who lived south of Canal Street (i.e., near the World Trade Center), the prevalence of PTSD was 20.0%. Predictors of PTSD in a multivariate model were Hispanic ethnicity, two or more prior stressors, a panic attack during or shortly after the events, residence south of Canal Street, and loss of possessions due to the events. Predictors of depression were Hispanic ethnicity, two or more prior stressors, a panic attack, a low level of social support, the death of a friend or relative during the attacks, and loss of a job due to the attacks. *Conclusions:* There was a substantial burden of acute PTSD and depression in Manhattan after the September 11 attacks. Experiences involving exposure to the attacks were predictors of current PTSD, and losses as a result of the events were predictors of current depression. In the aftermath of terrorist attacks, there may be substantial psychological morbidity in the population.

GLASS, T.A. & SCHOCH-SPANAN, M. (2002). **Bioterrorism and the people: How to vaccinate a city against panic.** *Clinical Infectious Diseases*, 34, 217-223. Bioterrorism policy discussions and response planning efforts have tended to discount the capacity of the public to participate in the response to an act of bioterrorism, or they have assumed that local populations would impede an effective response. Fears of mass panic and social disorder underlie this bias. Although it is not known how the population will react to an unprecedented act of bioterrorism,

experience with natural and technological disasters and disease outbreaks indicates a pattern of generally effective and adaptive collective action. Failure to involve the public as a key partner in the medical and public-health response could hamper effective management of an epidemic and increase the likelihood of social disruption. Ultimately, actions taken by nonprofessional individuals and groups could have the greatest influence on the outcome of a bioterrorism event. Five guidelines for integrating the public into bioterrorism response planning are proposed: (1) treat the public as a capable ally in the response to an epidemic, (2) enlist civic organizations in practical public health activities, (3) anticipate the need for home-based patient care and infection control, (4) invest in public outreach and communication strategies, and (5) ensure that planning reflects the values and priorities of affected populations.

HALL, M.J. & NORWOOD, A.E. (in press). **Preparing for bioterrorism at the state level: Report of an informal survey.** *American Journal of Orthopsychiatry*. Members of eighteen states' departments of mental health were interviewed about their plans for managing the psychosocial impacts of a bioterrorism event. Questions were developed from recommendations of an international conference on Planning for Bioterrorism. Information derived from the survey highlights the need for, and the importance of, mental health consultation to the state's planning process. Familiarity with the unique psychological and behavioral consequences of a bioterrorism event in contrast to natural disasters is essential. Realistic training scenarios that incorporate likely psychosocial impacts and appropriate mental health response must be developed.

HOLLOWAY, H.C., NORWOOD, A.E., FULLERTON, C.S., ENGEL, C.C., & URSANO, R.J. (1997). **The threat of biological weapons: Prophylaxis and mitigation of psychological and social consequences.** *Journal of the American Medical Association*, 278, 425-427. The microbial world is mysterious, threatening, and frightening to most people. The stressors associated with a biological terrorist attack could create high numbers of acute and potentially chronic psychiatric casualties who must be recognized, diagnosed, and treated to facilitate triage and medical care. Media communications, planning for quarantine and decontamination, and the role of community leaders are important to the mitigation of psychological consequences. Physicians will need to accurately diagnose anxiety, depression, bereavement, and organic brain syndromes to provide treatment, reassurance, and the relief of pain.

HYAMS, K.C., MURPHY, F.M., & WESSELY, S. (2002). **Responding to chemical, biological, or nuclear terrorism: The indirect and long-term health effects may present the greatest challenge.** *Journal of Health Politics, Policy and Law*, 27, 273-291. The possibility of terrorists employing chemical, biological, or nuclear/radiological (CBN) materials has been a concern since 1995 when sarin gas was dispersed in a Tokyo subway. Contingency planning almost exclusively involved detection, containment, and emergency health care for mass casualties. However, it is clear that even small-scale CBN incidents—like the recent spread of anthrax spores through the mail—can cause widespread confusion, fear, and psychological stress that have lasting effects on the health of affected communities and on a nation's sense of well-being. More emphasis therefore needs to be placed on indirect effects and on the medical, social, economic, and legal consequences that follow months to years afterward. To respond effectively to CBN attacks, a comprehensive strategy needs to be

developed that includes not only emergency response, but also long-term health care, risk communication, research, and economic assistance. Organizing an effective response challenges government institutions because the issues involved—eligibility for health care, the effects of low-level exposure to toxic agents, stress-related illnesses, unlicensed therapeutics, financial compensation—are complex and controversial.

KARSENTY, E., SHEMER, J., ALSHECH, I., COJOCARU, B., MOSCOVITZ, M., SHAPIRO, Y., & DANON, Y.L. (1991). **Medical aspects of the Iraqi missile attacks on Israel.** *Israel Journal of Medical Sciences*, 27, 603-607. During the period 18 January-28 February 1991, a total of 39 Iraqi modified Scud missiles landed in Israel, most of them in the densely populated Tel Aviv area. There were 23 missile attack alerts. These attacks caused 1,059 cases of injury; there were 2 deaths and 232 patients were admitted to emergency rooms for injuries directly related to the explosions, only one of which was severe. A survey among 91 of the injured showed that 46.6% of the wounds were caused by glass splinters, 31.1% were blunt contusions, and 22.2% were acute psychological reactions. No case of blast injury was reported. Inappropriate injection of atropine was reported in 230 cases. Acute anxiety was the reason for admission of 544 patients to emergency rooms. Another 40 patients sustained various traumas while rushing to the sealed room. The relatively low number of injured people is striking in view of the density of population in the areas hit. Various explanations are discussed.

NORRIS, F.H., FRIEDMAN, M.J., WATSON, P.J., BYRNE, C.M., DIAZ, E., & KANIASTY, K. (2002). **60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001.** *Psychiatry*, 65, 207-239. Results for 160 samples of disaster victims were coded as to sample type, disaster type, disaster location, outcomes and risk factors observed, and overall severity of impairment. In order of frequency, outcomes included specific psychological problems, nonspecific distress, health problems, chronic problems in living, resource loss, and problems specific to youth. Regression analyses showed that samples were more likely to be impaired if they were composed of youth rather than adults, were from developing rather than developed countries, or experienced mass violence (e.g., terrorism, shooting spree) rather than natural or technological disasters. Most samples of rescue and recovery workers showed remarkable resilience. Within adult samples, more severe exposure, female gender, middle age, ethnic minority status, secondary stressors, prior psychiatric problems, and weak or deteriorating psychosocial resources most consistently increased the likelihood of adverse outcomes. Among youth, family factors were primary. Implications of the research for clinical practice and community intervention are discussed in a companion article.

NORTH, C.S., NIXON, S.J., SHARIAT, S., MALLONEE, S., MCMILLEN, J.C., SPITZNAGEL, E.L., & SMITH, E.M. (1999). **Psychiatric disorders among survivors of the Oklahoma City bombing.** *Journal of the American Medical Association*, 282, 755-762. **CONTEXT:** Disasters expose unselected populations to traumatic events and can be used to study the mental health effects. The Oklahoma City bombing is particularly significant for the study of mental health sequelae of trauma because its extreme magnitude and scope have been predicted to render profound psychiatric effects on survivors. **Objective:** To measure the psychiatric impact of the bombing of the Alfred P. Murrah Federal Building in Oklahoma City on survivors of the direct blast, specifically examining rates of PTSD, diagnostic comorbidity,

functional impairment, and predictors of postdisaster psychopathology. *Design, Setting and Participants:* Of 255 eligible adult survivors selected from a confidential registry, 182 (71%) were assessed systematically by interviews approximately 6 months after the disaster, between August and December 1995. *Main Outcome Measures:* Diagnosis of 8 psychiatric disorders, demographic data, level of functioning, treatment, exposure to the event, involvement of family and friends, and physical injuries, as ascertained by the Diagnostic Interview Schedule/Disaster Supplement. *Results:* 45% of the subjects had a postdisaster psychiatric disorder and 34.3% had PTSD. Predictors included disaster exposure, female sex (for any postdisaster diagnosis, 55% vs 34% for men; chi-square (1) = 8.27; $P = .004$), and predisaster psychiatric disorder (for PTSD, 45% vs 26% for those without predisaster disorder; chi-square (1) = 6.86; $P = .009$). Onset of PTSD was swift, with 76% reporting same-day onset. The relatively uncommon avoidance and numbing symptoms virtually dictated the diagnosis of PTSD (94% meeting avoidance and numbing criteria had full PTSD diagnosis) and were further associated with psychiatric comorbidity, functional impairment, and treatment received. Intrusive reexperience and hyperarousal symptoms were nearly universal, but by themselves were generally unassociated with other psychopathology or impairment in functioning. *Conclusions:* Our data suggest that a focus on avoidance and numbing symptoms could have provided an effective screening procedure for PTSD and could have identified most psychiatric cases early in the acute postdisaster period. Psychiatric comorbidity further identified those with functional disability and treatment need. The nearly universal yet distressing intrusive reexperience and hyperarousal symptoms in the majority of nonpsychiatrically ill persons may be addressed by nonmedical interventions of reassurance and support.

NORTH, C.S. & PFEFFERBAUM, B. (2002). **Research on the mental health effects of terrorism.** *Journal of the American Medical Association*, 288, 633-636. The terrorist attacks of September 11, 2001, established a backdrop against which mental health effects of disasters, especially large-scale intentionally created disasters, assumed central stage in U.S. public health. Methodologically sound data are required to understand the mental health effects of terrorism and must guide all postdisaster mental health activities from clinical interventions to administrative policy. However, conducting methodologically solid epidemiologic investigations of mental health is extraordinarily difficult in the chaotic and complex settings of disasters, particularly those associated with terrorism. The study by Schlenger and colleagues reported in this issue of the *Journal* assessed postdisaster mental health in one of the most complex and challenging disaster settings in U.S. history. [Adapted from Text]

OHBU, S., YAMASHINA, A., TAKASU, N., YAMAGUCHI, T., MURAI, T., NAKANO, K., MATSUI, Y., MIKAMI, R., SAKURAI, K., & HINOHARA, S. (1997). **Sarin poisoning on Tokyo subway.** *Southern Medical Journal*, 90, 587-593. On the day of the disaster, 641 victims were seen at St. Luke's International Hospital. Among those, 5 victims arrived with cardiopulmonary or respiratory arrest with marked miosis and extremely low serum cholinesterase values; 2 died and 3 recovered completely. In addition to these 5 critical patients, 106 patients, including 4 pregnant women, were hospitalized with symptoms of mild to moderate exposure. Other victims had only mild symptoms and were released after 6 hours of observation. Major signs and symptoms in victims were miosis, headache, dyspnea, nausea, ocular pain, blurred vision, vomiting, coughing, muscle weakness, and agitation. Almost all patients showed

miosis and related symptoms such as headache, blurred vision, or visual darkness. Although these physical signs and symptoms disappeared within a few weeks, psychological problems associated with PTSD persisted longer. Also, secondary contamination of the house staff occurred, with some sort of physical abnormality in more than 20%.

SCHLENGER, W.E., CADDELL, J.M., EBERT, L., JORDAN, B.K., ROURKE, K.M., WILSON, D., THALJI, L., DENNIS, J.M., FAIRBANK, J.A., & KULKA, R.A. (2002). **Psychological reactions to terrorist attacks: Findings from the National Study of Americans' Reactions to September 11.** *Journal of the American Medical Association*, 288, 581-588. *Context:* The terrorist attacks of September 11, 2001, represent an unprecedented exposure to trauma in the United States. *Context:* The terrorist attacks of September 11, 2001, represent an unprecedented exposure to trauma in the United States. *Objectives:* To assess psychological symptom levels in the United States following the events of September 11 and to examine the association between postattack symptoms and a variety of indices of exposure to the events. *Design:* Web-based epidemiological survey of a nationally representative cross-sectional sample using the Posttraumatic Stress Disorder (PTSD) Checklist and the Brief Symptom Inventory, administered 1 to 2 months following the attacks. *Setting and Participants:* Sample of 2273 adults, including oversamples of the New York, NY, and Washington, DC, metropolitan areas. *Main Outcome Measures:* Self-reports of the symptoms of PTSD and of clinically significant nonspecific psychological distress; adult reports of symptoms of distress among children living in their households. *Results:* The prevalence of probable PTSD was significantly higher in the New York City metropolitan area (11.2%) than in Washington, DC (2.7%), other major metropolitan areas (3.6%), and the rest of the country (4.0%). A broader measure of clinically significant psychological distress suggests that overall distress levels across the country, however, were within expected ranges for a general community sample. In multivariate models, sex, age, direct exposure to the attacks, and the amount of time spent viewing TV coverage of the attacks on September 11 and the few days afterward were associated with PTSD symptom levels; sex, the number of hours of television coverage viewed, and an index of the content of that coverage were associated with the broader distress measure. More than 60% of adults in New York City households with children reported that 1 or more children were upset by the attacks. *Conclusions:* One to 2 months following the events of September 11, probable PTSD was associated with direct exposure to the terrorist attacks among adults, and the prevalence in the New York City metropolitan area was substantially higher than elsewhere in the country. However, overall distress levels in the country were within normal ranges. Further research should document the course of symptoms and recovery among adults following exposure to the events of September 11 and further specify the types and severity of distress in children.

SCHUSTER, M.A., STEIN, B.D., JAYCOX, L.H., COLLINS, R.L., MARSHALL, G.N., ELLIOTT, M.N., ZHOU, A.J., KANOUSE, D.E., MORRISON, J.L., & BERRY, S.H. (2001). **A national survey of stress reactions after the September 11, 2001, terrorist attacks.** *New England Journal of Medicine*, 345, 1507-1512. *Background:* People who are not present at a traumatic event may experience stress reactions. We assessed the immediate mental health effects of the terrorist attacks on September 11, 2001. *Methods:* Using random-digit dialing three to five days after September 11, we interviewed a nationally representative sample of 560 U.S. adults about their reactions to the terrorist attacks and their perceptions of their children's reactions. *Results:* 44% of the

adults reported one or more substantial symptoms of stress; 90% had one or more symptoms to at least some degree. Respondents throughout the country reported stress symptoms. They coped by talking with others (98%), turning to religion (90%), participating in group activities (60%), and making donations (36%). 84% of parents reported that they or other adults in the household had talked to their children about the attacks for an hour or more; 34% restricted their children's television viewing. 35% of children had one or more stress symptoms, and 47% were worried about their own safety or the safety of loved ones. **Conclusions:** After the September 11 terrorist attacks, Americans across the country, including children, had substantial symptoms of stress. Even clinicians who practice in regions that are far from the recent attacks should be prepared to assist people with trauma-related symptoms of stress.

SUSSER, E.S., HERMAN, D.B., & AARON, B. (2002, August). **Combating the terror of terrorism.** *Scientific American*, 287, 72-77. The psychological damage caused by the attacks of September 11 mirrored the physical destruction and showed that protecting the public's mental health must be a component of the national defense.

URSANO, R.J. (2002). **Post-traumatic stress disorder.** *New England Journal of Medicine*, 346, 130-132. The primary goal of terrorism is to erode the security of a nation, to disrupt the continuity of society, and to destroy the nation's morale, cohesion, and values. Both the health care system and individual physicians are critical to the safety and future of our nation. During or after an attack of bioterrorism, fear can disrupt communities as people try to feel safe by distancing themselves emotionally from those who have been exposed or who are ill. Physicians can counter patients' fears by educating them about the degree of actual risk, providing information on ways of decreasing risk, and teaching coping strategies. [Adapted from Text]

WESSELY, S., HYAMS, K.C., & BARTHOLOMEW, R. (2001). **Psychological implications of chemical and biological weapons: Long term social and psychological effects may be worse than acute ones.** *British Medical Journal*, 323, 878-879. Chemical and biological weapons are quintessentially weapons of terror. The now routine journalistic association between chemical and biological weapons and the word terror confirms that the purpose of these weapons is to wreak destruction via psychological means—by inducing fear, confusion, and uncertainty in everyday life. It is customary to expect large-scale panic if such weapons are ever effectively deployed or thought to be deployed. Examples of mass sociogenic illness remind us of the dangers of inadvertently amplifying psychological responses to chemical and biological weapons. [Adapted from Text]

ADDITIONAL CITATIONS

Annotated by the Editor

BENEDEK, D.M., HOLLOWAY, H.C., & BECKER, S.M. (2002). **Emergency mental health management in bioterrorism events.** *Emergency Medicine Clinics of North America*, 20, 393-407.

Reviews the mental health effects of bioterrorism and discusses the implications of the findings for emergency medical response. Topics covered include primary and secondary prevention, traumatic stress in relation to bioterrorism, treatment, and planning for mental health response.

FINE, A. & LAYTON, M. (2001). **Lessons from the West Nile viral encephalitis outbreak in New York City, 1999: Implications for bioterrorism preparedness.** *Clinical Infectious Diseases*, 32, 277-282.

Examined an outbreak of viral encephalitis in terms of its relevance for planning response to bioterrorism. The authors provide a description of elements needed to manage a large-scale outbreak of infectious disease and make suggestions about how public health capacity can be strengthened to respond to such an outbreak.

FULLERTON, C.S. & URSANO, R.J. (1990). **Behavioral and psychological responses to chemical and biological warfare.** *Military Medicine*, 155, 54-59.

Reviews findings on the long-term outcomes associated with exposure to nerve agents and other organophosphates, either accidentally or in chemical warfare training exercises. The authors present the implications of the existing data for individuals working in a chemical and biological warfare environment.

GARRETT, L. (2001). **Understanding media's response to epidemics.** *Public Health Report*, 116 (Supplement 2), 87-91.

Provides a journalist's perspective on the media's role in disseminating information about bioterrorism. The tone is generally favorable (toward the media), and the author reminds readers that the media can be a bridge in the trust between government and the public.

INGLESBY, T.V., GROSSMAN, R., & O'TOOLE, T. (2001). **A plague on your city: Observations from TOPOFF.** *Clinical Infectious Diseases*, 32, 436-445.

Describes the findings of a congressionally-directed bioterrorism exercise that involved top officials in the U.S. government. The exercise uncovered problems of leadership and decision-making, difficulties in resource allocation, and a need to formulate adequate principles of disease containment.

KUHR, S. & HAUER, J.M. (2001). **The threat of biological terrorism in the new millennium.** *American Behavioral Scientist*, 44, 1032-1041.

Reviews the history of biological warfare, provides a summary of the most threatening biological agents, and discusses response to biological terrorism in terms of issues such as risk assessment, health surveillance, and emergency medical capabilities.

PFEFFERBAUM, B., NIXON, S.J., KRUG, R.S., TIVIS, R.D., MOORE, V.L., BROWN, J.M., PYNOOS, R.S., FOY, D., & GURWITCH, R.H. (1999). **Clinical needs assessment of middle and high school students following the 1995 Oklahoma City bombing.** *American Journal of Psychiatry*, 156, 1069-1074.

Administered a clinical needs assessment to 3,218 middle and high school students in Oklahoma City 7 weeks after the bombing of the Alfred P. Murrah Federal Building. Over 60% of students reported hearing or feeling the explosion, and over one-third reported knowing someone who was killed.

SCHOCH-SPANNA, M. (2000). **Implications of pandemic influenza for bioterrorism response.** *Clinical Infectious Diseases*, 31, 1409-1413.

Examined an influenza pandemic in terms of its relevance for planning response to bioterrorism. The authors propose that elements of an adequate response include the capacity to care for mass casualties, earning public confidence, and fair allocation of health resources.

PILOTS UPDATE

Once a year, Dartmouth College publishes a thick book called *Organization, Regulations, and Courses*. Because the National Center for PTSD is affiliated with Dartmouth, we like to encourage the use of our resources by Dartmouth students and faculty. So we go through this catalog and write to the instructors of every course that might touch upon traumatic stress studies, to tell them about our PTSD Resource Center and the PILOTS database.

Dartmouth offers both an undergraduate major and a Ph.D. program in Psychology and Brain Sciences, but does not have a graduate program in clinical psychology. Even so, we are always able to find several courses in which PTSD might reasonably be chosen as a topic for a student's term paper or research project.

It is hardly unexpected to find many potential opportunities for the study of PTSD in a psychology department. But there is a surprising breadth of course offerings in other departments to which the PTSD literature — and the National Center's resources — are potentially relevant.

In the social sciences, issues explored in a course on "Political Anthropology" include state and non-state violence in non-Western societies. The experiences of Argentine and Chilean survivors of political persecution and torture, refugees and asylum seekers emigrating from Africa and the Near East, and survivors of war and genocide in Indochina are all reflected in the traumatic stress literature, furnishing an opportunity for cross-cultural comparison. "Legacies of Conquest in Latin America" might offer an opportunity to reflect on the traumas experienced by native peoples at the time of conquest, and the persisting sequelae of those traumas.

A course on the "History of Warfare" offers many opportunities to examine issues connected with PTSD — especially with such recent books as Eric Dean's *Shook over Hell* and Jonathan Shay's *Achilles in Vietnam* and his new *Odysseus in America* to draw upon. The extensive literature on survivors and their descendants makes "History of the Holocaust" another possible venue for the study of PTSD. The study of the Holocaust is not limited to the History

department: "Evil and Suffering: Reflections on the Holocaust" in the Religion department and "Representing the Holocaust: History, Memory and Survival" in Comparative Literature are both courses in which a motivated student might wish to study its psychological sequelae.

Other literature courses offer many opportunities to explore topics connected with PTSD. "War and Peace and Israeli Literature," "Nationhood and National Identity in 20th-Century German Culture," and "French Literature: Postwar, Postcolonial, Postmodern" deal with recent experience overseas. "Representations of America's War in and about Vietnam" is a reminder that Americans, too, have a tradition of writing about national traumas. Many of these courses have an interdisciplinary focus, and indeed several are cross-listed in two or more departments. The traumatic stress literature is itself an interdisciplinary one, and so it lends itself to use in exploring so many facets of our life and times.

The PILOTS database uses descriptors such as "Historical Account" and "Critique" to identify publications that would be of particular interest to those taking a cultural approach to the study of traumatic stress. "Historical Account" is used for publications taking a historical approach to the sequelae of traumatic events and the nosology of those sequelae. "Critique" is applied to publications offering evaluation or analysis of literary and artistic works. An entire hierarchy of terms grouped under "Policy Issues" in the PILOTS Thesaurus can be used to identify publications dealing with social science aspects of traumatic stress.

We would encourage readers of the *PTSD Research Quarterly* to explore the possibility of integrating an exploration of psychological trauma into appropriate courses at their own institutions. A colleague in the humanities or social sciences might appreciate the offer of a brief introduction to the subject. Anyone inspired by such a presentation to learn more about PTSD can use the National Center's website and the PILOTS database to delve as deeply into the subject as he or she might wish.

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